

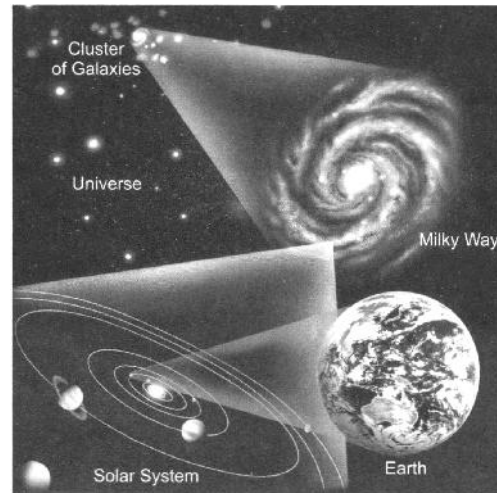
# THE UNIVERSE

## INTRODUCTION

The universe is a huge space which contains everything that exists.

The vast expanse of space that contains everything in it is known as the universe. It includes the sun, the planets, the Milky Way galaxy and all the other galaxies. The universe is continually expanding. Nobody knows how big the universe is. It is impossible to even have shown that the universe is getting bigger and bigger, like a balloon being blown up.

The branch of science that deals with the study of heavenly bodies is called astronomy. People who study the universe are called astronomers. The most important instrument used by the astronomers is the telescope.



### FACT FILE

- The universe is so vast in relation to the matter it contains that it can be compared with a building 20 miles long, 20 miles wide and 20 miles high that contains 1 grain of sand.
- The three most common elements in the universe are hydrogen, helium and oxygen.

## NIGHT SKY

During the daytime you can see only the sun, which appears to move from East to West.

After sunset, the night sky is dotted with bright stars. At night the moon and thousands of stars are seen twinkling in the sky. If you watch the sky through a telescope you may see millions of stars, some of which are brightly coloured. You see certain groups of stars which appear to be forming figures in clusters. They are called constellations. The moon is a natural satellite of earth whose size changes every day. Moon completes one revolution around the earth in **27 days, 7 hours and 43 minutes**.

Furthermore, you see an occasional comet, which appears as a ball of fire, having a tail. Then, there are shooting stars or meteors. They appear to fall from the sky. In addition to all these there are some bright heavenly bodies which do not twinkle. They are called planets.

The natural bodies in the sky are called celestial bodies or heavenly bodies. Example- The sun, the earth, the moon, planets, stars, meteors, comets are called heavenly bodies or celestial bodies.

### THEORIES OF THE ORIGIN OF UNIVERSE :-

The three main theories are :-

- (1) **Bigbang theory** :- According to this theory the universe was born after a massive explosion called the bigbang. A long time after the big bang, stars like our sun were formed. At that time clouds of hot gases and particles revolved around the sun. Over time, many particles got stuck together to form large bodies. The bodies pulled in smaller objects near them by gravitational force. "This made them larger still. These bodies finally become the planets and this universe has been expanding ever since".
- (2) **Steady state Theory** :- This theory states that the universe appears the same at all times and at all points. It is unchanging without a beginning or an end.

- (3) **Pulsating Theory :-** This theory states that all matter is flying apart from a heavily compacted mass and will eventually slow down, begin to contract and become so condensed that it will explode again and the expansion will start again.

## MEASUREMENT OF DISTANCES IN THE UNIVERSE

The distances between heavenly bodies in space are very large. It is very difficult to measure these distances in kilometre. That is why, they are expressed in terms of light year and parsec.

- (a) **LIGHT YEAR:** A light year is the distance travelled by the light at a speed of 300,000 km/s.

If a spaceship could travel at the speed of light ( $3 \times 10^5$  km/s), it would reach the moon in just over 1 second.

**1 light year = Speed of light  $\times$  365 days = 3,00,000 km/s  $\times$  365  $\times$  24  $\times$  60  $\times$  60 sec.**

**= 9,460,000, 000, 000 km**

**1 light year =  $9.46 \times 10^{12}$  km (approx.)** The sun, the closest star to earth, is about 8 light minutes away from it. It means that light from sun takes about 8 minutes to reach the Earth.

The star closest to the Earth after the Sun is Alpha Centauri. It is 4.3 light years away from Earth, i.e., it is at a distance of  $4.3 \times 9.46 \times 10^{12}$  km from Earth. It also implies that light from this star, visible on Earth, at a particular night would have left its surface approximately 4.3 years ago.

- (b) **PARSEC:** One Parsec (pc) is equal to 3.26 light years. The distance of Proxima Centauri which is a companion of, Alpha Centauri' is 1.3 parsec

## STARS AND PLANETS

A star is a heavenly body which has light of its own. We are able to count **3000 stars** in the sky with the naked eye. With the help of a small telescope, we can see **100,000 stars**, Nearly **20 thousand million** stars can be seen through a powerful telescope. The stars are very large in size and are several times bigger than the sun but some are smaller. They appear small because they are very far away.



Stars consist of large amount of hydrogen gas at very high temperature. They are so hot that they give out light. It is because of this light that stars glow at night. They move in the sky but their positions remain fixed in the sky with respect to other stars. They seem to twinkle due to air disturbances in the atmosphere of earth. The Sun is a star which gives light all the time.

"Planets are heavenly bodies which revolve around the Sun." They do not have their own light but reflect the light of the Sun that falls on them. Planets do not twinkle. They move with respect to the Earth as well as with respect to the sun. The Earth is also a planet. Till recently there were nine planets in the solar system but now the last, i.e., the ninth planet- Pluto has been removed from being called a planet.

## TEST YOUR SELF

1. What is the universe?
2. What is a telescope?
3. Define astronomy.
4. What do you understand by the heavenly bodies?
5. What do astronomers study?
6. What is a light year?
7. Name the star closest to earth after sun.
8. What are stars?
9. Differentiate between stars and planets.
10. 1 parsec = ..... Light years.

Stars	Planets
<ol style="list-style-type: none"> <li>1. Stars are dot shaped.</li> <li>2. Stars twinkle.</li> <li>3. Stars have their own light.</li> <li>4. Stars have very high temperature.</li> <li>5. There are billions of stars in the galaxy.</li> </ol>	<ol style="list-style-type: none"> <li>1. Planets are disc shaped.</li> <li>2. Planets do not twinkle.</li> <li>3. Planets do not have light they take it from sun.</li> <li>4. Planets have low temperature.</li> <li>5. There are only eight planets in the solar system.</li> </ol>

## THE SOLAR SYSTEM

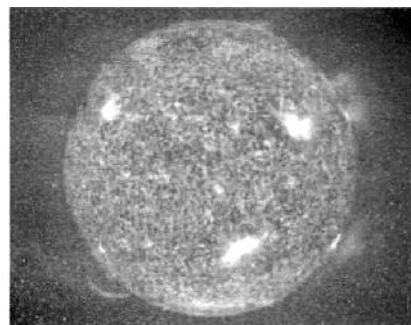
"The sun and all the bodies moving around it are together called the Solar System".

The solar system consists of the sun, the eight planets, moon, comets and asteroids which revolve around the sun in almost circular paths or orbits.

## THE SUN

The closest star to the Earth is Sun. The average distance of the sun from the Earth is **150 million** kilometre which is about **110 times** the diameter of the Earth. The temperature at its centre is about **14 million** degree Celsius; while its surface temperature is about **6000°C** the temperature of Sun is very high because of very hot gases present in it. Hydrogen and helium are the gases which produce heat and light in the sun.

The sun is the brightest object in the sky. It is about 333000 times heavier than the earth and you could fit more than a million earth inside it. Its great mass cause a large gravitational force. This keep the sun and planets. The moons and some other smaller bodies together are as the sun family.



**The Sun**

## PLANETS

The solar system is the set of eight planets including Earth. All the planets move around the sun in elliptical orbits. At the same time they spin or rotate on their own axis within the solar system.

Each planet takes different time to complete one revolution around the sun. Earth takes about **365 $\frac{1}{4}$  days**. Mercury which is closest to the Sun takes only **88 days** to complete one revolution.

Beside revolving around the sun in **365 $\frac{1}{4}$  days**, the Earth also rotates about its axis once every **24 hours**. Other planets also rotate on their axes. The period of rotation is least for Jupiter, only **9 hours 55 minutes** and the maximum for Venus which is **243 earth days**.

The planets are bright objects visible at night looking like stars. Some of them on being seen carefully, seem to be brighter and bigger than the stars. Some of the planets are known from ancient times while some were discovered only after telescope became available to observe the night sky.

After the sun planets are the largest bodies in our solar system. Scientists define a planet as a round body that orbits the sun and which has pulled in all objects near its orbit. Planets were formed when large bodies in space pulled in smaller bodies near it.

There are eight planets in the solar system. In order of their distance from Sun, they are described below:

(1) Mercury (2) Venus (3) Earth (4) Mars (5) Jupiter (6) Saturn (7) Uranus and (8) Neptune

1. **MERCURY (BUDH) :** It is the first and the nearest planet to the Sun. Being very close to the Sun, Mercury is very hot during the day (**about 400°C**) and extremely cold at night (**about -200°C**). It has no atmosphere because of its gravitational force. Mercury is covered with many bowl shaped holes called craters. Mercury is occasionally visible just before the sunrise or immediately after the sunset. It appears like a very bright star and is also known as the morning or evening star. Although it is not a star it is called morning or evening star because of its brightness. Mercury also resembles moon in many ways. Both are nearly of the same size and mass. Both have no atmosphere and their surfaces are rocky too.



**Mercury**

2. **VENUS (SHUKRA) :**

It is the second planet from the sun and its closest planet is the Earth. Venus is of about the same size as the Earth. It is a very hot planet (**about 480°C**), even hotter than Mercury. Though it is farther away from the sun, it appears to be brightest of all planets, moon and stars, visible in the night sky. It is due to its cloudy atmosphere that reflects almost 3/4 of the sunlight that falls on it. It occasionally appears as an evening star just above the western horizon. It sometimes also appears as morning star in the eastern sky. As it is closer to the sun it is not visible throughout the year.



**Venus**

### FACT FILE

- Venus rotates so slow that a typical day lasts approximately 244 Earth days (15,856 hours).

### 3. EARTH (PRITHVI) :

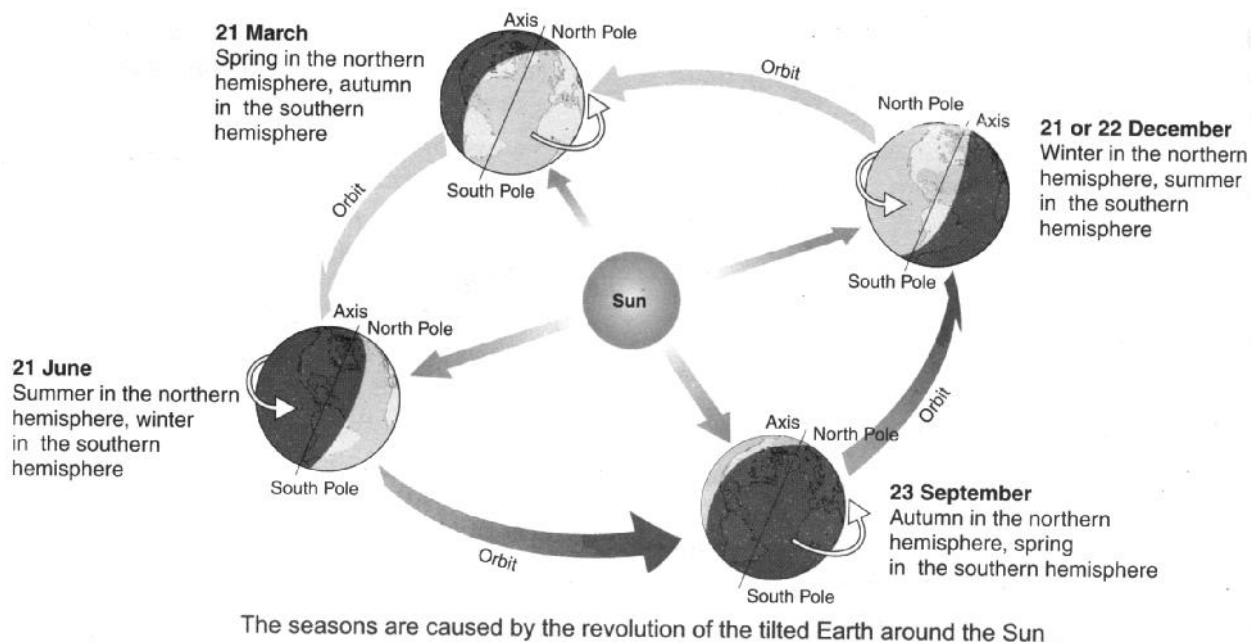
It is the third planet from the sun. The Earth is the only planet to have life on it. All the factors supporting life are known to be present on Earth only. The average diameter of Earth is about 12,800 kilometre.

The Earth as you know, revolves around the sun in 365.25 days known as one Year. It also rotates about an imaginary axis that passes through its North and south poles. This rotation causes day and night on the earth.

The change in seasons on the earth takes place due to the tilting of its axis of rotation and the change in its position with respect to the sun. It is tilted at an angle of  $23\frac{1}{2}^{\circ}$ . As the tilting is always in the same direction therefore the tilting of the northern and southern hemisphere of the earth towards the sun keeps changing throughout the year. Figure given above shows the change of seasons on four dates **21 March, 21 June, 23 September and 21/22 December**.



**Earth**



### 4. MARS (MANGAL) :

It is the fourth planet in the order of increasing distance from the sun. It is seen as a reddish coloured object in the sky, hence it is sometimes also called the red planet. It is believed that Mars has a large amount of water in the form of ice, near its polar caps. The diameter of Mars is slightly more than half of that of the earth but its mass is only one tenth of that of the earth. It is believed to have lots of carbon dioxide on it. Astronomers are investigating the fact that it may have water and also it may have life in some form. It has a thin atmosphere which enables to view its surface from the earth.



**Mars**



5. **JUPITER (BRIHASPATI) :**

It is the fifth planet from the sun. It is the largest planet of the solar system. It is so large that about **1300 Earths** can be placed inside this planet. It has a large red spot on its surface. This spot is actually a giant storm. Its distance from Sun is more than the sum of distances of first four planets from the Sun. For this reason, it gets less light and heat of the Sun. Yet it appears brighter than almost all other planets due to thick atmosphere surrounding it. It has a faint ring around it. It can be observed as a very bright object for about half the year in the evening sky. Jupiter has **28 moons**.



**Jupitar**

**FACT FILE**

- Jupiter has the shortest day (of a hours 55 minutes) among all the planets.
- Jupiter's moon Ganymede is the largest moon in the Solar System, and is larger than the planet mercury.

6. **SATURN (SHANI) :**

It is the sixth planet from the sun. Its distance from sun is almost double the distance of Jupiter from the sun. Its size, mass and composition is similar to Jupiter but it is colder than Jupiter. It has three beautiful flat rings encircling in which are made of particles possibly consisting of ice. These rings are not visible by the naked eye but can be observed with the help of a telescope.

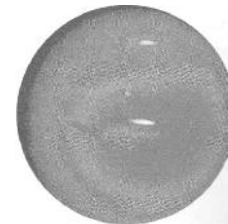
Saturn rotates about the axis in 0.44 days and completes its revolution around the sun in 29.5 years. Due to very low temperature, life is not possible on Saturn.



**Saturn**

7. **URANUS :**

It is the seventh planet from the sun. It was discovered by an English astronomer, **William Herschel, in 1781**. Uranus is a large planet and is very far away from the sun and the Earth. It appears green when seen through a telescope. It is a very cold planet and thus cannot sustain life.



**Uranus**

8. **NEPTUNE :**

It is the eighth planet from the Sun. After Uranus, this was the second planet to be discovered with the help of a telescope. It was discovered by **Urbain Jean Joseph Leverrier a French astronomer in 1846**. His predictions and later discovery of Neptune were based on' the . changes observed in the path of Uranus from its orbit.



**Neptune**

**GALAXIES**

A galaxy is an assemblage of billions of stars together with gas and dust which are bound to one another by gravitational forces.

**TYPES OF GALAXIES :-**

(1) **Spiral galaxy :-**

A spiral galaxy is a flattish disc with a large bulge at the centre. The central region is very bright. Spiral arms coil outwards directly from the bulge.

Our sun is a part of spiral galaxy called the milky way galaxy. This galaxy is named after the milky way. The milky way is a band of stars that we can see on a clear night.

Our milky way galaxy (Akash ganga) and another one andromeda galaxy are examples.

(2) **Elliptical galaxy :-**

An elliptical galaxy is like a spiral galaxy without arms. Example : M 87

(3) **Irregular galaxies :-**

These galaxies do not have specific shape.

Example : The large and small magellanic clouds.

## CONSTELLATIONS

In the sky, some stars appear in distinct group consisting of a few stars arranged in such a way so as to form different shapes.

A group of such stars whose arrangement can be compared with different shapes is called a constellation. You can easily identify some constellations even with the naked eye. Some constellations are discussed below:

1. **Ursa Major (Vrihat Saptarishi)**

Ursa Major contains seven bright stars arranged in the pattern resembling some what a big spoon. Ursa Major is also given the name **Big Dipper**. This name is derived from the word 'dipper' which in olden days meant a large spoon used for drinking water. Ursa Major is also known as the **Great Bear** because along several other faint stars, it forms the shape of a bear.



Ursa Major

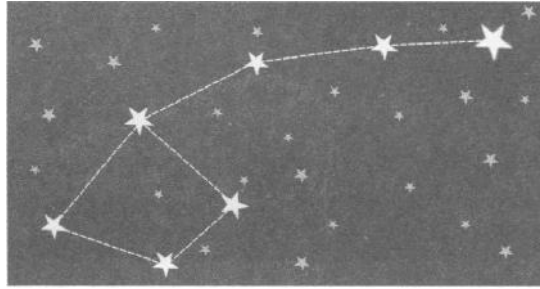
In the group of stars in Ursa Major, seven are comparatively . brighter and are easily visible in northern part of sky in the months from April to September.

**Pole star** can also be located with the help of Ursa Major. Pole star is visible towards the north and remains stationary in the sky with respect to the earth.

A straight line drawn through the two stars at the top (called pointers) of Ursa Major passes through the pole star. The Pole Star was used by sailors to find the north direction. The Indian name of Ursa Major constellation is **Saptarishi Mandal**.

2. **Ursa Minor (Laghu Saptarishi)**

Ursa Minor or **Small Dipper** also contains seven prominent stars in it. It is also one of the easily identifiable constellations. The stars in Ursa Minor are smaller as compared to Ursa Major. This constellation is an outline of a small bear or ladle of a kite with long tail. A question mark at the tail of Ursa Minors is a star of average brightness. It is called: Pole star and the Indian name of Pole star is **Dhruv Tara**. Pole star appears stationary in the sky and all other constellations appear to revolve around it.

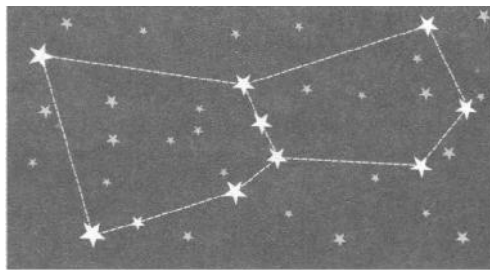


### Ursa Minor

The Indian name of Ursa Minor constellation is Laghu Saptarishi. It can be seen in July during summer.

### 3. Orion (Mriga)

Orion or **Hunter** is another constellation which is visible during winter season. It looks like a hunter and is one of the most magnificent constellations in the sky. It has seven bright stars and several faint ones. Four bright stars make the shoulders and legs of the hunter and these stars mark its belt. Some faint stars complete the picture.



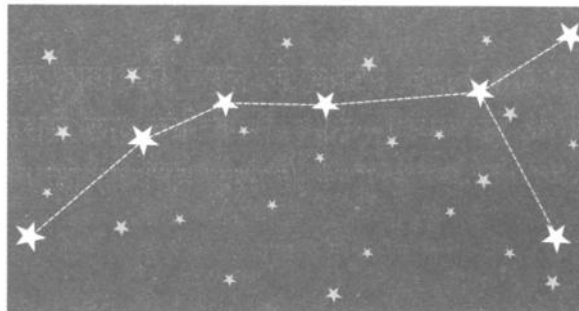
### Orion constellation

One of the largest star known as **Betelgeuse** and another bright star called **Rigel** are situated at its two corners.

The Indian name of Orion constellation is Vyadha or Mriga.

### 4. Scorpio (Vrishchika)

This constellation contains seven bright stars. Along with other faint stars, it forms the shape of a scorpion. It is visible during winter months. The Indian name of Scorpio constellation is Vrishchika.



### Scorpio constellation

### 5. Cassiopeia (Sharmishtha)

This constellation is a group of five stars arranged in the form of W. It is seen near pole star and is visible in the month of October in northern sky. The Indian name of Cassiopeia constellation is Sharmishtha.

### 6. Pleiades (Krutika)

The stars in this constellation do not have any particular arrangement. It looks like a cluster of stars and twinkling gems in the night sky. The cluster of stars in this constellation are called **globular clusters**. It is visible in winter months. The Indian name of Pleiades constellation is Kruttika.



	Galaxy	Constellation
1.	It is a collection of billion of stars	It is a star-pattern having a few stars
2.	There are around 100 billion galaxies in the universe	There are 88 constellation identified till date
3.	A galaxy get its shape due to actual distribution of stars in it.	The pattern of a constellation is due to the apparent positions of bright stars

## COMETS

Comets are very small sized celestial bodies which revolve around the sun in highly elliptical orbits. Comets appear like a ball of fire with a long tail. The length of the tail of a comet increases while coming towards the sun. It disappears again when "comet moves away from the sun. The tail of comet always points away from the sun because of pressure of solar radiations.



**Halley's Comet**

Out of the many comets appearing again and again, one of the most famous comet is **Halley's comet**. It is usually visible in the night sky once in 76 Years. Halley's comet was last seen in 1986. It is believed to appear again in 2062.

## METEOR AND METEORITES

Meteors are very small stone like objects revolving around the sun. These are bright star like objects which appear suddenly in the sky and then for a few moment glow with a brilliant white flash of light falling towards the earth. Although they are not stars but they are called **shooting stars** as they glow like a star. While falling on the earth these stone like objects when enter into the atmosphere of earth, get heated due to friction of air, they get so much heated that they first glow brightly and start evaporating. Hence They sky momentarily.

Some meteors are so large that they do not get completely burnt and evaporated. Then a part of them reaches the surface of the earth. These unburnt part of the meteors are called **meteorites**.

### FACT FILE

**The Barringer crater in Arizona, USA was formed when a large meteorite struck the earth.**



Meteorites are helpful for scientists as they get to study the nature of celestial objects that are the part of the solar system.

## SATELLITES

A satellite is a body which is constantly revolving in an orbit around a planet is called a satellite. There are two types of satellites.

### (1) NATURAL SATELLITES

A heavenly body which revolves around a planet is called a natural satellite. Ex. – Moon.

The earth has only one natural satellite, the moon. It is held in a fixed orbit around the earth because of earth's gravity. It shines because it reflects the light of the sun. It completes its revolution around the earth in **27.3 days**. It also takes **27.3 days** to complete one rotation about its own axis.

Mercury and Venus have no moon while Jupiter, Saturn and Uranus have **28, 30 and 21 moons** respectively.

#### FACT FILE

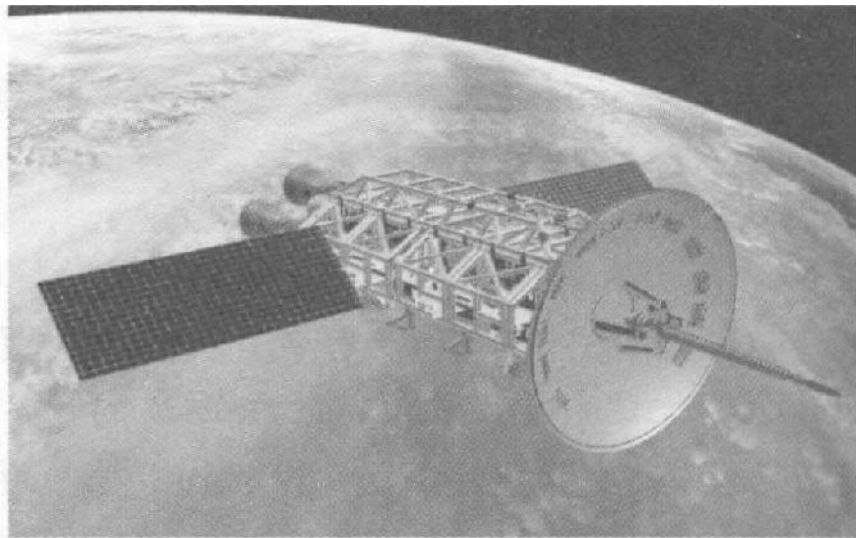
- The saying once in a blue moon refers to the occurrence of two full moons during one calendar month.
- A full moon is nine times brighter than a halfmoon.

### (2) ARTIFICIAL SATELLITES

A man made object made to revolve around the earth is called an artificial satellite. Ex.-Aryabhata.

Nowadays it is very easy to make long distance calls through telephone, forecast weather, locating mineral resources etc. It all became possible because of artificial satellites. Several countries including India have sent artificial satellites into space. These satellites revolve around the Earth continuously.

The first artificial satellite was sent by **USSR (now Russia) on October 4, 1957**. It was called **Sputnik-I**. India sent her first satellite into space on **April 19, 1975**. It was called **Aryabhata**. Some other Indian satellites are **Bhaskara, Rohini, Insat 1-B and Insat 2-B**. Today, there are various satellites in space.



**An artificial satellite**

#### **Artificial satellites :-**

They are of two types :-

#### **(1) Geostationary or Geosynchronous satellites**

A satellite which revolves around the earth in an equatorial plane in the same direction with same time period as that of earth is called geostationary satellite.

It appears stationary with respect to any point on the surface of earth.

## (2) **Polar Satellite**

A satellite which revolves around the earth in an orbit which passes over its north and south poles is called polar satellite.

### **IMPORTANCE OF ARTIFICIAL SATELLITES**

1. Radio and television transmission.
2. To study and forecast weather.
3. Long distance telephone communication.
4. Locating mineral resources.
5. Gathering information about outer space.

### **Weather Monitoring :-**

Weather monitoring is to keep a continuous track of various factors on which the weather depends.

The weather is monitored by a fleet of polar and geostationary satellites.

The satellite help meteorologists to make instant weather forecasts including early warnings of weather extremes such as hurricanes cyclones, floods or drought conditions. It enables the government to take appropriate measure to minimize loss of life and property.

### **Remote Sensing :-**

The technique of gathering information about the earth through artificial satellites is called remote sensing.

Remote sensing satellite are placed in sun-synchronous orbits.

(Sun-synchronous orbit is a special type of polar orbit in which satellite passes over a latitude at the same local time every day.)

Important applications of remote sensing satellites :-

- (1) Ground water and forest surveys.
- (2) Detection of potential fishing zones.
- (3) Spying for military purposes.

### **TEST YOUR SELF**

1. Why does the tail of comet always point away from the sun?
2. Meteors are not stars, but still they are called shooting stars. Why?
3. Differentiate between meteors and meteorites.
4. How many natural satellite(s) does Earth have?
5. Give three benefits of artificial satellites.

### **IMPORTANT POINTS**

- The universe includes all galaxies, stars, planets, and everything else that exists.
- One light year is the distance travelled by light in one year. Distances in space are measured in light years.
- Stars have light of their own while planets and their satellites reflect light from the sun.
- The solar system consists of the Sun, the eight planets, the moon, comets and asteroids.
- Alpha Centauri is the nearest star to the solar system.
- Constellations are the groups of stars that appear to form a known pattern when viewed from the Earth.
- Comets, meteors and meteorites are other heavenly bodies the solar system.

# EXERCISE-1

## CHOOSE THE MOST APPROPRIATE ANSWER:

- The distance of the star Alpha Centauri from the Earth  
(A) 4.3 light years (B) 3.26 light year  
(C) 2 million light years (D) 4.3 light minutes
- The nearest Planet to the sun is  
(A) Earth (B) Jupiter (C) Mercury (D) Venus
- The Indian name of Cassiopeia constellation is  
(A) Kruttika (B) Sharmishtha (C) Vyadha (D) Vrishchika
- Moon completes one revolution around the Earth in  
(A) 24 hours (B) 30 days (C) 27.3 days (D) 1 Year
- The first artificial satellite launched was  
(A) Insat 1-A (B) Insat 1-8 (C) Sputnik 1 (D) None of the above

## FILL IN THE BLANKS:

- The branch of science that deals with the study of heavenly bodies is called .....
- The heavenly bodies that do not twinkle are called .....
- The star closest to Earth after sun is .....
- The average distance of the sun from Earth is .....
- The most famous comet is ..... comet.

## MATCH THE COLUMNS:

Column-I	Column-II
1. Pole star	(a) Vrishchika
2. Meteors	(b) Red planet
3. Scorpio	(c) Ursa Minor
4. Natural satellite	(d) Shooting stars
5. Mars	(e) Moon

## STATE WHETHER TRUE OR FALSE:

- The sun reflects the light of other nearby stars.
- The Halley's comet can be seen from the Earth every 86 years.
- Light year is the unit of distance travelled by light in 10 years.
- The first artificial satellite sent by USSR was Aryabhata.
- Meteors that finally reach the earth surface are called meteorites.

**ANSWER THE FOLLOWING QUESTIONS IN SHORT :**

1. How far is the Sun from the Earth?
2. Name the planet nearest to the Earth.
3. What is a comet?
4. Differentiate between stars and planets.
5. Define a constellation.
6. How many natural satellites do Jupiter and Saturn have?
7. How many kilometre equal 1 light year?

**ANSWER THE FOLLOWING QUESTIONS IN DETAIL:**

1. Write a short note on the sun and the solar system. Also mention the sun's composition and temperature.
  2. Define a constellation and write a short note on two constellations.
  3. Give a brief description of all the planets.
  4. What are stars? Give examples.
  5. Differentiate between natural and artificial satellites. Write the importance of artificial satellites.
  6. Why is life not possible on Venus?
  7. Why do scientists expect life on the Mars?
-

## EXERCISE-2

1. Mark the following statements as True (T) or False (F):

- (a) Pole star is a member of the solar system.
- (b) Mercury is the smallest planet of the solar system.
- (c) Uranus is the farthest planet in the solar system.
- (d) INSAT is an artificial satellite.
- (e) There are nine planets in the solar system.
- (f) Constellation Orion can be seen only with a telescope.

**Ans.** (a) False (b) True (c) False (d) True (e) False (f) False.

2. In which part of the sky can you find Venus if it is visible as an evening star?

**Ans.** Western sky.

3. Name the largest planet of the solar system.

**Ans.** Jupiter (Brihaspati).

4. What is a constellation? Name any two constellations.

**Ans.** Constellations are a group of stars that appear to form some recognizable shape. For examples, Ursa Major and Orion.

5. Draw sketches to show the relative positions of prominent stars in:

- (a) Ursa Major and (b) Orion.

**Ans.** (a)



**Fig. Ursa Major**

(b)



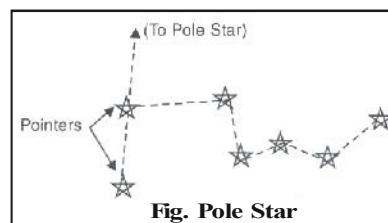
**Fig. Orion**

6. Name two objects other than planets which are members of the solar system.

**Ans.** Comets, asteroids and meteors.

7. Explain how you can locate the Pole Star with the help of Ursa Major.

**Ans.** Pole star can be located with the help of the two stars at the end of Ursa Major. Imagine a straight line passing through these stars as shown in Fig.. Extend this imaginary line towards the north direction. (About five times the distance between the two stars). This line will lead to a star which is not too bright. This is the Pole Star. Verify that the Pole star does not move as all other stars drift from east to west.



**Fig. Pole Star**

8. Do all the stars in the sky move? Explain.

**Ans.** No, stars actually do not move but they only appear to move from east to west, as the earth from where we see them, rotates from west to east. However pole star, which is situated in the direction of the earth's axis. It does not appear to move.



9. Why is the distance between stars expressed in light years? What do you understand by the statement that a star is eight light years away from the Earth?

**Ans.** The Sun is nearly 150,000,000 kilometres (150 million km) away from the earth.

The next nearest star to the earth after the Sun is Alpha Centauri. It is at a distance of about 40,000,000,000,000 km from the earth. Some stars are even further away. It is not convenient to express such distances in kilometres.

Such large distances are expressed in another unit known as light year. One light year is the distance travelled by light in one year.

If we say that a star is eight light years away from earth, it means that the light from that star will reach the earth in eight years.

10. Why do we classify the sun as a star?

**Ans.** Sun is classified as a star because it

(i) has its own source of energy. (ii) is continuously emitting huge amount of heat and light.

(iii) has a life period. It was born 5 billion years ago and is expected to glow for another 5 billion years.

11. Differentiate between 'a star' and 'shooting star'.

	Star	Shooting star
<b>Ans.</b>	1. A star is made of hot gases like hydrogen	A shooting star is made up of rock and metal
	2. A star is self-luminous	A shooting star has no light of its own.
	3. A star does not get destroyed due to friction.	A shooting star burns due to heat of friction when entering the atmosphere of the earth
	4. A star is very big in size	A shooting star is very very small.

12. Mention the four independent motions of the earth.

**Ans.** The earth has the following four independent motions :-

- (i) Revolution of the earth in elliptical orbit round the sun.
- (ii) Rotation of the earth about its own axis, once in 24 hours.
- (iii) Spinning of the earth about its axis.
- (iv) Motion of the earth along with the sun and other planets in space.

[illegible]